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DEPARTMENT OF THE AIR FORCE

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Office of the Under Secretary

4 December 1963

NRO REVIEW COMPLETED

MEMORANDUM FOR CHAIRMAN, USIB

SUBJECT: Security Implications of the CORONA C''' Camera Flown
in the U-2 Aircraft (112 Camera System)

In response to the USIB request, I have had my staff study the matter of possible compromise from Soviet-Allied examination of the 112-A (C''') camera system flown in the Lockheed U-2 aircraft, if this system were to be downed in an area under their control and the camera and film completely or partially recovered. Two members of the NRO Staff visited Itek on 27 November 1963 for discussions with Messrs. Wolfe, [redacted] Drawings and mockups of the 112-A system were studied and compared to the CORONA satellite cameras. The following subjects were included in these discussions: size, shape, weight, power requirements, camera design, film metering, scanning mechanism, mounts, radiation, pressurized camera bay, cycle rates--IMC, static electricity, inertial balance mechanisms, lens filter, windows, film, exposures, supply spools, takeup spools, factory markings, etc.

The 112-A camera system has undergone many modifications from the satellite version. Some of the major changes are: the IMC and cycle times have been changed without any obvious telltale results showing these modifications as changes; the horizon cameras have been removed; the inertial balance mechanism has been removed; a fan has been installed to cool the power motor; there is no gold plate used for radiation shielding; equipment is relocated; base plate is modified to fit space available in U-2; mechanical and electrical modifications have been made.

One feature of the camera that could give a possible indication that this design is adapted from satellite operations is the solenoid operated pressure backs for the two horizon cameras. In the satellite version, these had the functions of holding the film stationary during both the main camera exposure scan and the horizon exposure. The horizon cameras have been removed, however the former function still exists, and the backs therefore remain in use. The film metering

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is the same as for satellite application so that an excessive gap is present between the main camera frames where the horizon photos used to be. This excessive spacing on a system that is film limited might cause further examination of the horizon camera areas of the camera. Although horizon sensing per se is not conclusive evidence of satellite application, this arrangement could be indicative of horizon sensing from satellite altitudes since the measurable (15°) depression angle of the horizon camera mounts corresponds to the depression of the earth's horizon at altitudes which have been typical of many Thor/Agena launched satellites over the Soviet Union.

It is concluded that except for the present film metering on¹ camera #51 (this excessive gap will be corrected on the 112-B dual mount camera system) there is nothing about the camera system that would necessarily prove a satellite or balloon design; on the other hand, there is nothing that would preclude the camera's use in space with a few modifications. The combination of optical performance, film size and coverage capability in relation to publicly released size of the recovery capsule, and the size and weight of the camera would certainly make sense to any intelligent observer who is prompted to consider this possibility. This same statement could not be made about aircraft cameras of the appropriate dimensions and weight, due to the substantial limitations on the amount of aircraft film that could be recovered in the recovery capsule, and due to the substantially lower optical performance of the aircraft cameras.

The Soviets have cameras from the HYAC Program (461 L balloon program) from several years ago. The Soviets also have had good data on the B camera since May 1960. They know it was a 1955-1956 design and could conjecture that the U. S. was flying a modification of the B camera in the Thor/Agena satellite series unless the U. S. had something better to fly. If they assume a modified B camera is used in the satellites by direct extrapolation they could conclude a limited coverage capability of better than 24 feet ground resolution. However, the coverage would be limited considerably by the photographic scale and the amount of the (9 1/2") B camera film which could be recovered. Further improvements in lenses and film from this 1955-1956 design would be expected for satellite application resulting in some improvement in resolution. However, if they recovered a 112 type camera, or even an intact lens, or exposed film, they could establish

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the probable system resolving capability, and could conclude that this system could yield 10 foot ground resolution under ideal circumstances if utilized in a satellite.

Cameras and especially film spools are very difficult to destroy, and it is probable that film would survive almost any crash and a deliberate attempt to destroy it.

As to the present classification of the 112 cameras, a data book has been prepared and disseminated at SECRET level regarding C^{III} camera geometry and related capabilities as used in the aircraft, but no mention of a space capability or space history is mentioned. This data was made available at SECRET level because of necessity--the camera data can be of no higher classification than resultant photography, e. g., Cuban photography is disseminated at SECRET level. Though the capabilities of this camera have been made known at this relatively low security level, the actual camera has been considered to be TOP SECRET CORONA, and great care has been taken during camera operations at Barksdale AFB.

We understand that Itek has been given permission by the Agency to advertise the 24 inch F. L., f 3.5 Petzval lens (used in the 112-A system), but not a specific camera design, but cannot advertise the space history or the fact that the lens is in production.

On the basis of this brief study I believe that the following conclusions are indicated:

a. There appears to be no characteristic of the 112-A or 112-B camera system which would necessarily prove that these instruments have been adapted from configurations that have been employed in satellites.

b. However, there are several characteristics which could lead to the following deductions by the Soviets:

(1) The weight, shape and size of the camera is such that it could be carried by the Thor/Agena combination.

(2) The optical performance is such that if it were carried by the Thor/Agena, the best ground resolution of approximately 10 feet could be expected from altitude at which many Thor/Agena satellites have flown (and continue to fly) over the Soviet Union.

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(3) The film size and photographic scale is such as to provide substantial coverage of the Soviet territory during the 4 or 5 days active life which has characterized most Thor/Agena recovery type satellites.

These facts, when analyzed in the light of the unclassified release of all Thor/Agena orbits, the unclassified public display of a recovery capsule, and the fact that the Soviets can determine when recoveries are made could result in Soviet deduction of the truth in a logical, consistent and credible manner, although, of course, not actually provable in the legalistic sense.

Signed
Brockway McMillan
Director
National Reconnaissance Office

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